

use them until we approve your request.

#### § 1066.15 Overview of test procedures.

This section outlines the procedures to test vehicles that are subject to emission standards.

(a) In the standard-setting part, we set emission standards in g/mile (or g/km), for the following constituents:

- (1) Total oxides of nitrogen, NO<sub>x</sub>.
- (2) Hydrocarbons (HC), which may be expressed in the following ways:
  - (i) Total hydrocarbons, THC.
  - (ii) Nonmethane hydrocarbons, NMHC, which results from subtracting methane (CH<sub>4</sub>) from THC.
  - (iii) Total hydrocarbon-equivalent, THCE, which results from adjusting THC mathematically to be equivalent on a carbon-mass basis.
  - (iv) Nonmethane hydrocarbon-equivalent, NMHCE, which results from adjusting NMHC mathematically to be equivalent on a carbon-mass basis.
- (3) Particulate mass, PM.
- (4) Carbon monoxide, CO.

(b) Note that some vehicles may not be subject to standards for all the emission constituents identified in paragraph (a) of this section.

(c) We generally set emission standards over test intervals and/or drive schedules, as follows:

(1) *Vehicle operation.* Testing may involve measuring emissions and miles travelled in a laboratory-type environment or in the field. The standard-setting part specifies how test intervals are defined for field testing. Refer to the definitions of “duty cycle” and “test interval” in § 1066.701. Note that a single drive schedule may have multiple test intervals and require weighting of results from multiple test phases to calculate a composite distance-based emission value to compare to the standard.

(2) *Constituent determination.* Determine the total mass of each constituent over a test interval by selecting from the following methods:

(i) *Continuous sampling.* In continuous sampling, measure the constituent's concentration continuously from raw or dilute exhaust. Multiply this concentration by the continuous (raw or dilute) flow rate at the emission sampling location to determine the con-

stituent's flow rate. Sum the constituent's flow rate continuously over the test interval. This sum is the total mass of the emitted constituent.

(ii) *Batch sampling.* In batch sampling, continuously extract and store a sample of raw or dilute exhaust for later measurement. Extract a sample proportional to the raw or dilute exhaust flow rate, as applicable. You may extract and store a proportional sample of exhaust in an appropriate container, such as a bag, and then measure HC, CO, and NO<sub>x</sub> concentrations in the container after the test phase. You may deposit PM from proportionally extracted exhaust onto an appropriate substrate, such as a filter. In this case, divide the PM by the amount of filtered exhaust to calculate the PM concentration. Multiply batch sampled concentrations by the total (raw or dilute) flow from which it was extracted during the test interval. This product is the total mass of the emitted constituent.

(iii) *Combined sampling.* You may use continuous and batch sampling simultaneously during a test interval, as follows:

(A) You may use continuous sampling for some constituents and batch sampling for others.

(B) You may use continuous and batch sampling for a single constituent, with one being a redundant measurement, subject to the provisions of 40 CFR 1065.201.

(d) Refer to the standard-setting part for calculations to determine g/mile emission rates.

(e) The regulation highlights several specific cases where good engineering judgment is especially relevant. You must use good engineering judgment for all aspects of testing under this part, not only for those provisions where we specifically re-state this requirement.

#### § 1066.20 Units of measure and overview of calculations.

(a) *System of units.* The procedures in this part follows both conventional English Units and the International System of Units (SI), as detailed in NIST Special Publication 811, which we incorporate by reference in § 1066.710.

(b) *Units conversion.* Use good engineering judgment to convert units between measurement systems as needed. The following conventions are used throughout this document and should be used to convert units as applicable:

(1) 1 hp = 33,000 ft·lbf/min = 550 ft·lbf/s = 0.7457 kW.

(2) 1 lbf = 32.174 ft·lbm/s<sup>2</sup> = 4.4482 N.

(3) 1 inch = 25.4 mm.

(c) *Rounding.* The rounding provisions of 40 CFR 1065.20 apply for calculations in this part. This generally specifies that you round final values but not intermediate values. Use good engineering judgment to record the appropriate number of significant digits for all measurements.

(d) *Interpretation of ranges.* Interpret a range as a tolerance unless we explicitly identify it as an accuracy, repeatability, linearity, or noise specification. See 40 CFR 1065.1001 for the definition of tolerance. In this part, we specify two types of ranges:

(1) Whenever we specify a range by a single value and corresponding limit values above and below that value, target any associated control point to that single value. Examples of this type of range include “±10% of maximum pressure”, or “(30 ±10) kPa”.

(2) Whenever we specify a range by the interval between two values, you may target any associated control point to any value within that range. An example of this type of range is “(40 to 50) kPa”.

(e) *Scaling of specifications with respect to an applicable standard.* Because this part 1066 applies to a wide range of vehicles and emission standards, some of the specifications in this part are scaled with respect to a vehicle's applicable standard or weight. This ensures that the specification will be adequate to determine compliance, but not overly burdensome by requiring unnecessarily high-precision equipment. Many of these specifications are given with respect to a “flow-weighted mean” that is expected at the standard or during testing. Flow-weighted mean is the mean of a quantity after it is weighted proportional to a corresponding flow rate. For example, if a gas concentration is measured continuously from the raw exhaust of an engine, its flow-weighted mean concentration is the

sum of the products of each recorded concentration times its respective exhaust flow rate, divided by the sum of the recorded flow rates. As another example, the bag concentration from a CVS system is the same as the flow-weighted mean concentration, because the CVS system itself flow-weights the bag concentration. Refer to 40 CFR 1065.602 for information needed to estimate and calculate flow-weighted means.

#### § 1066.25 Recordkeeping.

The procedures in this part include various requirements to record data or other information. Refer to the standard-setting part regarding recordkeeping requirements. If the standard-setting part does not specify recordkeeping requirements, store these records in any format and on any media and keep them readily available for one year after you send an associated application for certification, or one year after you generate the data if they do not support an application for certification. You must promptly send us organized, written records in English if we ask for them. We may review them at any time.

### Subpart B—Equipment, Fuel, and Gas Specifications

#### § 1066.101 Overview.

(a) This subpart addresses equipment related to emission testing, as well as test fuels and analytical gases. This section addresses emission sampling and analytical equipment, test fuels, and analytical gases.

(b) The provisions of 40 CFR part 1065 specify engine-based procedures for measuring emissions. Except as specified otherwise in this part, the provisions of 40 CFR part 1065 apply for testing required by this part as follows:

(1) The provisions of 40 CFR 1065.140 through 1065.195 specify equipment for exhaust dilution and sampling systems.

(2) The provisions of 40 CFR part 1065, subparts C and D, specify measurement instruments and their calibrations.

(3) The provisions of 40 CFR part 1065, subpart H, specify fuels, engine fluids, and analytical gases.

(4) The provisions of 40 CFR part 1065, subpart J, describe how to measure